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DRAFT -- STATEMENT OF WORK

RESEARCH AND DEVELOPMENT SUPPORT (RDS) SERVICES FOR THE NATIONAL ENERGY TECHNOLOGY LABORATORY (NETL)

The following format has been used for this Statement of Work (SOW):

1.0 Background
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1.0 BACKGROUND

1.1 General

National Energy Technology Laboratory (NETL) is a national laboratory, owned and operated by the U.S. Department of Energy (DOE). NETL implements research and development (R&D) programs to advance energy and energy-related environmental technology. The DOE Assistant Secretary for Fossil Energy is NETL's Lead Program Secretarial Officer. Currently, the greatest portion of funding to NETL comes from DOE's Office of Fossil Energy; the remainder, about 10%, comes from other DOE programs (e.g., the Office of Energy Efficiency and Renewable Energy and Office of Legacy Management, as well as other Federal agencies).

NETL conducts R&D activities both on-site through its in-house research organization and off-site through financial assistance agreements (i.e., grants and cooperative agreements) and contractual arrangements. The nearly 1,300 research, development, and demonstration (RD&D) projects in NETL's portfolio are conducted in partnership with industry, universities, other national and Federal laboratories, private research organizations, and other Federal and state agencies. The hallmark of NETL is the ability to assemble industrial, academic, and Governmental resources to create know-how and technology to address energy issues.

NETL is the only national laboratory within the DOE complex that is Government-owned and -operated (GOGO). NETL employees conduct various functions, including performing in-house R&D activities, implementing contracted R&D efforts, performing analysis to support policy development, and establishing partnerships through licensing and Cooperative Research and Development Agreement (CRADA) activities. NETL has the authorities of a DOE operations office integrated with the implementing functions typically conducted by DOE Management and Operation (M&O) Contractors. About 550 Federal employees work on-site at NETL. The staff also includes over 550 Contractor employees who support NETL's activities.

Nearly one half of NETL's R&D activities are carried out by industry. This emphasis on partnering with the business community is essential to NETL's mission. To be successful, the advanced technologies emerging from NETL's research programs must be commercialized. Private-sector involvement brings about a better understanding of end-user needs and helps assure that the new technologies will gain rapid acceptance in the marketplace. Therefore, collaboration and cost-sharing with the private sector throughout the RD&D process provides an intrinsic technology transfer mechanism that accelerates the deployment of new technologies.

In addition, the researchers at NETL apply advancements in science to develop new technologies to address emerging issues. The success of the in-house research program is currently measured according to the extent of a) knowledge dissemination (e.g., by the number of peer-reviewed publications), b) technology transfer through licenses and CRADAs, and c) collaboration with the research community (e.g., university partnerships).

1.2 NETL Mission and Vision

NETL's primary mission is conducting and implementing science and technology programs to resolve the environmental, supply, and reliability constraints of producing and using fossil resources. This work is segmented according to coal, oil, and gas programs. Additional information on NETL's R&D programs can be found at www.netl.doe.gov.

NETL's vision is to be the preferred provider of energy technology and policy options that benefit the public. To do this the laboratory will strive to:

- Become a world-class institution noted for the advancement of energy science and technology by attracting leading researchers and establishing state-of-the-art facilities.
- Create a research environment that fosters multi-disciplinary collaboration and the generation of innovations with the potential for major improvements in the cost, environmental performance, and reliability of energy services.
- Be recognized for addressing energy and environmental issues through partnerships with research institutions, the private sector, and Government agencies.
- Promote economic development through supporting the commercialization of technology, building an educated workforce, and establishing strong collaborations with academic institutions and businesses.

1.3 NETL Program and Technical Support Areas

1.3.1 NETL Technology Sectors

Overall, NETL's activities to advance energy and energy-related environmental technology are organized by Technology Sectors. NETL's Technology Sectors to be supported by the Contractor shall include, but not be limited to, the following:

- *Coal and Power Systems* – conducts R&D, as well as studies to support policy development, in the areas of advanced combustion technologies, gasification technologies, carbon sequestration, environmental control technologies, fuel cells, turbines, and hybrid technologies.
- *Natural Gas Technology* - conducts R&D, as well as studies to support policy development, in the areas of natural gas exploration, production, transmission, and storage utilization.
- *Petroleum Technology* – conducts R&D, as well as studies to support policy development, to improve the efficiency and environmental quality of domestic oil operations.
- *Climate Change Policy Support* – conducts studies to support the development of mechanisms to encourage the adoption of greenhouse gas reducing technologies domestically and abroad.
- *DOE Office of Energy Assurance* – conducts R&D and analyses to examine and maintain the integrity of the energy infrastructure (e.g., electricity generation and delivery, fuel processing and storage, and pipeline delivery systems). Within the energy assurance arena, supports analyses of critical energy assets, energy sector emergencies, technology development and application, as well as training activities at the Energy Infrastructure Training and Analysis Center (EITAC).
- *DOE Office of Energy Efficiency/Renewable Energy (EERE)* - provides as requested quality solutions in EERE program lines (e.g., distributed energy, Freedom Car, building technologies, weatherization initiatives, Federal energy management program, mining industrial technology programs, BioMass activities to include black liquor activities, hydrogen and fuel cell initiatives).
- *Other Energy Initiatives* – supports national-level, advanced initiatives as requested from other DOE Offices (e.g., National Nuclear Security Administration, Engineering and Construction Management) and non-DOE activities including Homeland Security (e.g., critical infrastructure interdependencies; technology transfer; data/product sharing; all-hazards emergency response; non-proliferation of WMD).

1.3.2 NETL In-House R&D Focus Areas

From the various Technology Sectors discussed above, NETL's in-house R&D organization concentrates on several

key areas referred to as "Focus Areas." The current NETL in-house Focus Areas to be supported by the Contractor shall include, but not be limited to, the following:

- *Carbon Sequestration Science* – provides long-range options through research and field testing for sequestering carbon dioxide by geologic, ocean, and terrestrial methods.
- *Advanced Fuel Systems* – conducts research to advance conversion and separation processes, including performing work in hydrogen production, separation, and storage technologies; natural gas hydrates; catalyst and membrane development; and natural gas-to-liquids conversion.
- *Computational Energy Science* – develops computational models and mathematical simulations, including visualization techniques, to examine the behavior of engineered systems at various scales (ranging from the microscopic- to the complex system-scale).
- *Advanced Power Systems* – addresses emissions from advanced, coal-fired power systems by conducting R&D on the efficient separation and/or removal of selective species from the exhaust stream (e.g., the removal of sulfur species, small particles, or hydrogen from gas streams).
- *Environmental Research* – conducts research to minimize or abate environmental problems associated with the mining and use of fossil fuels in such areas as air pollution from conventional combustion processes (e.g., mercury emissions from coal-fired power plants), watershed analysis (e.g., characterization and abatement of acid mine drainage from shuttered coal mines), and by-product utilization (e.g., use of fly-ash resulting from coal-fired combustion processes).
- *Energy System Dynamics* – investigates the fundamental mechanisms of combustion and conversion under dynamic conditions to enhance the efficiency, flexibility, and reliability of fossil-based gas or liquid fueled technologies, such as turbines and fuel cells.

2.0 SCOPE

2.1 Framework

The Contractor should have a sufficient level of expertise to successfully manage and integrate all stages of science and technology development leading to commercially viable solutions.

Through this contract (solicitation), NETL wants to establish a highly capable, yet flexible, R&D support organization that has the ability to:

- Recruit top-level scientists, engineers, technology managers, and analysts to assist in examining and addressing priority energy issues.
- Maintain an environment that stimulates innovation and creativity.
- Utilize effective management practices that best transfer advancements in science and technology into viable energy and environmental options that can be deployed by energy and related industries and that benefit the public.

2.2 Core Work and Variable Work

Under this contract the Contractor shall conduct both "core work" and "variable work." Core and variable work can be physically conducted either on-site (i.e., at the Morgantown, WV; Pittsburgh, PA; Tulsa, OK; and Fairbanks, AK sites of NETL) or off-site. Core work is defined as predictable, schedulable, and recurring work of a longer duration (typically 1 year or more). The primary emphasis of this contract will be to provide core Contractor resources to support NETL's R&D activities. This core work will be typically conducted on-site using on-site Contractor resources.

"Variable work" is defined as work that can be anticipated under the course of this contract; however, it will be variable and shorter with respect to the amount of work, the timing of work, the duration of work, and the scope of work. Variable work may be performed on-site or off-site, using either on-site or off-site Contractor resources, depending upon resource availability and task requirements.

The Contractor shall provide off-site resources (typically through the variable work provision of this contract) that

would augment core on-site R&D Contractor capabilities. The ability to draw on external resources provides NETL the ability to assemble a virtual capability on a project-specific basis. Some of these off-site resources (e.g., expertise and facilities) should be considered world-class or state-of-the-art.

2.3 Types of Services

In support of NETL's R&D mission, the Contractor shall provide service to the Government by:

- Effectively conducting research, development, demonstration, and deployment operations, both on (primarily) and off NETL sites.
- Marshalling off-site resources (e.g., facilities, equipment, and technical staff) to address expert and/or unique scientific or technological requirements that complement NETL on-site resources.
- Providing technical and economic analyses to assist decisions regarding investments in the R&D project portfolio, as well as formulating technology development and deployment strategies.
- Establishing partnerships with universities or institutions of higher learning, other research institutions, the business community, and Government organizations to help the Government define issues, advance NETL scientific and technological capabilities, and foster the dissemination of knowledge and technology.
- Enhancing the on-site, state-of-the-art capability with respect to equipment, facilities, and research staff (including scientists, engineers, and technical analysts).
- Supporting Federal efforts to identify and develop new R&D program areas to advance NETL's energy technologies in both traditional and non-traditional Fossil Energy mission areas.
- Supporting NETL's pursuit of funding opportunities from other Government or private-sector organizations by providing applicable knowledge, skills, abilities, and resources.
- Establishing and operating graduate and undergraduate student internship, postdoctoral and senior research fellowship, faculty and senior research exchange, summer research participation, and other educational outreach programs to attract top-level researchers and students to NETL sites.
- Engaging the private sector to effect the commercialization and transfer of technology and promote regional business development.
- Providing cross-cutting and integrated environmental, safety, and health (ES&H) services at NETL sites (Morgantown, WV; Pittsburgh, PA; Tulsa, OK; and Fairbanks, AK), as well as upon request to the Albany Research Center located in Albany, OR. This ES&H support will be completely integrated with NETL's Federal ES&H programs and will provide matrixed support (through NETL Federal staff) to other on-site support Contractors. In particular, the Contractor will support DOE initiatives such as integrated safety management, certified environmental management systems, and associated continuous improvement activities.
- Supporting Legacy Management functions such as long-term surveillance, monitoring and land use, policy, planning and maintenance.

2.4 General Characteristics of Work to Be Performed

The RDS services contract will be defined primarily (but not solely) by the following characteristics:

- It will provide support to the entire NETL professional workforce, including R&D, systems, project, and technology managers;
- It will utilize both on-site and off-site Contractor personnel to accomplish work;
- Individual tasks will oftentimes be associated with supporting multiple technical service areas listed in the SOW, requiring integration and synthesis of products, information and workflow; through these cross-cutting and integrated efforts, efficient and effective "life-cycle" management of R&D concepts and ideas will result;
- It will consist of predictable, longer-term tasks (under core work) with generally defined end objectives, but composed of smaller, serial subtasks (with more defined objectives) in which the results and deliverables of previous subtasks affect the design, deliverables, and specific objectives of subsequent subtasks;
- It will also consist of shorter-term tasks (under variable work) requiring unique and/or specialized resources and facilities to address specific technology barrier issues;
- Due to its RD&D emphasis, it will typically require scientists and engineers with high levels of training.

2.5 Resources

2.5.1 Contractor-Furnished Resources

The Contractor shall provide all personnel, facilities, equipment, materials, and supplies required to execute the work under this contract, except for that specifically identified as being provided by the Government in Section 2.4.2 of this SOW.

2.5.2 Government-Furnished Resources

See Provision H.4, Government Property and Data (SEP 2003).
See Provision H.27, Government Provided Services (June 2003).

2.6 Location of Performance

The primary locations for the performance of the work under this contract shall be at NETL sites in Morgantown, WV and Pittsburgh, PA. It is also possible work shall be performed at NETL's Tulsa, OK and Fairbanks, AK sites. Accomplishment of the work under this contract shall require some travel on the part of Contractor employees among NETL sites, and between NETL sites and other locations.

3.0 APPLICABLE DOCUMENTS

The following documents will be available for the solicitation phase only and are posted on the Site Support Contractor Reading room at the following internet site: www.netl.doe.gov/business/solicit/ssc2003/index.html.

List of Current Contractor-Operated Experimental Test Facilities (Posted under Section 2.0 Referenced Documents in the SOW).

List of Current Contractor-Operated Analytical Equipment (Posted under Section 2.0 Referenced Documents in the SOW).

Sample ES&H Task (Posted under Section 6.0 Sample Task Order).

4.0 TECHNICAL SERVICE AREAS/MANAGEMENT PERFORMANCE

The work to be accomplished by the Contractor under this contract is divided into Technical Service Areas depicted in Sections 4.1 through 4.7, and management performance activities as depicted in Section 4.8.

4.1 Technical Service Area - Partnership Development

The Contractor shall assist NETL Federal staff, in both in-house and contract research, in the conceptualization and conduct of activities associated with expanding existing, or pursuing new, R&D program areas. These efforts shall include, but not be limited to:

a. Marshalling off-site resources (e.g., facilities, equipment, and technical staff) to address scientific or technological needs, complement NETL resources, and advance NETL R&D capabilities.
b. Conducting analyses to ascertain the value of proposed R&D areas.
c. Assisting in developing, expanding, and augmenting on-site R&D capabilities, including finding additional research applications for on-site facilities, by establishing collaborative efforts with other research institutions, universities, and the business community, and by supporting CRADA activities.
d. Working closely with the private sector and other partners to foster the dissemination of knowledge, affect the transfer and commercialization of technology, and promote regional business development.
e. Supporting programmatic efforts to engage effectively with NETL stakeholders in the research, business, and Government sectors.

f. Establishing and operating graduate and undergraduate student internship, postdoctoral and senior research fellowship, faculty and senior research exchange, summer research participation, and other educational outreach programs to attract top-level researchers and students to NETL sites.

4.2 Technical Service Area - R&D Program Planning and Analysis

The Contractor shall assist Federal staff in program planning, analysis, and evaluation efforts that will enable NETL:

a. to determine optimum R&D portfolios with respect to meeting long-term national and global needs, Presidential initiatives, Departmental goals, and program strategies while complementing the capabilities and efforts of other research institutions and the private sector and
b. to support the budget planning process and the measurement of progress against performance targets, e.g., Government Performance Result Act (GPRA) requirements, Joule milestones, and Office of Management and Budget (OMB) R&D criteria.

These efforts shall include, but not be limited to:

a. Providing expert analyses of complex energy issues that examine technological, societal, environmental, and economic factors to support policy development and strategic planning.
b. Conducting assessments of world-wide scientific and technological progress towards specific energy issues, legislative requirements, and Departmental goals, and developing recommendations and options for additional research and development to resolve remaining gaps, including developing objectives for long-term research to best complement ongoing programs.
c. Performing authoritative risk and cost assessments that examine technological, economic, regulatory compliance, and commercial factors to determine the associated constraints, costs, and feasibility of meeting stated goals.
d. Assessing the strategy and progress of R&D programs through targeted studies and independent review boards and recommending actions to optimize technical, management, cost, and schedule performance.

4.3 Technical Service Area - R&D Project Planning and Analysis

The Contractor shall support the Federal project planning and assessment requirements, in both in-house and contract research, including assisting in determining technical performance, scale-up requirements, and commercial viability. These efforts shall include, but not be limited to:

a. Developing market-based product requirements and specifications for technologies and assessing project performance in meeting these requirements and specifications.
b. Performing competitive analyses to ascertain the value of a technology (e.g., with respect to performance and cost advantages, as compared to baseline and emerging technologies and practices).
c. Conducting engineering analyses to identify remaining scientific and technical issues for specified technology development efforts, recommending actions and marshalling resources to address the issues, and determining scale-up and balance-of-plant requirements (including developing and evaluating conceptual and detailed equipment/plant designs).
d. Performing analyses related to environmental and other regulatory issues, including ascertaining the impact of proposed and existing legislation with respect to the intended applications of specified technologies, and providing recommendations to address those issues.
e. Conducting analyses to ascertain the extent, feasibility, and timing of market acceptance, calculating valuations of specified technologies to assist in developing licensing and cost-sharing strategies, and developing commercialization plans that examine and compare technology transfer and deployment options.
f. Performing energy and environmental impact studies based upon an assessment of the extent of market adoption.
g. Developing work statements, including cost and schedule estimates, for proposed and on-going research and technology development efforts.
h. Organizing efforts to conduct peer reviews of science and technology development projects, including identifying the appropriate external experts.

i. Developing expert reports describing the performance of the research and technology efforts for dissemination to the research, regulatory, and business communities.
j. Assisting in the preparation of documents supporting National Environmental Policy Act (NEPA) compliance, such as Environmental Assessments, Environmental Impact Statements, Records of Decision, Findings of No Significant Impact, Mitigation Action Plans, and other related documents, as well as coordinating and supporting public scoping meetings, public hearings, and other public forums.

4.4 Technical Service Area - Research and Development (R&D) Operations

The Contractor shall support R&D operations primarily on-site, but also at off-site locations, including field testing sites. **For a hot link to the listing of current Contractor-operated experimental test facilities located at the Morgantown and Pittsburgh sites see Section 3.0, Application Documents of this SOW**. The R&D support activities include, but are not necessarily limited to:

a. Developing implementation plans based on NETL's R&D concepts. Implementation plans may include recommended design, construction, and operation approaches, as well as detailed cost and schedule estimates, for new equipment/facilities or modifications to existing equipment/facilities.
b. Designing, fabricating, installing, constructing, modifying, and altering onsite, small-scale R&D facilities and equipment. With respect to the construction of new large-scale facilities and equipment, as well as the modification of existing facilities or equipment that significantly impact a site's or building's structure, infrastructure, or utilities, work under this contract will be limited to the design of such systems. In these instances the Contractor will be expected to work with the site operations Contractor or other NETL Contractors. NETL will make the determination of what constitutes large-scale versus small-scale facilities.
c. Conducting experiments according to approved experimental plans including CRADAs. These experiments shall be planned and conducted according to NETL's quality assurance, ES&H, and other guidelines (as outlined in orders, operating plans, and procedures documented in NETL's directives system).
d. Utilizing NETL's work control procedures for planning and execution of work associated with on-site operations and, where applicable, for off-site operations.
e. Specifying and obtaining devices, equipment, services, supplies, and materials associated with R&D operations. This activity includes performing engineering calculations, conducting computer-aided design and modeling, determining materials specifications, providing quality assurance and quality control to fulfill design requirements, and preparing purchase requisitions.
f. Developing process and instrumentation drawings (P&IDs) from engineering design plans. The Contractor shall provide a working knowledge of industry instrumentation standards, such as those of Instrument Society of America (ISA), and shall be capable of producing completed P&IDs which shall be suitable for construction of research projects.
g. Programming distributed control systems and setting up data acquisition systems. The Contractor shall provide programming knowledge of distributed control system software, consistent with NETL operations, which is used to perform automated process control.
h. Purchasing, installing, calibrating, and maintaining instruments (e.g., process measurement and control devices associated with NETL research projects), but not those associated with systems requiring site-wide interfaces (e.g., gas alarms, hazard alarms, fire alarms, or emergency notification systems).
i. Providing training (e.g., specific and unique hazards training or operations training related to research operations) necessary for effective and efficient operations while ensuring a safe and healthful workplace environment.
j. Formulating and modifying standard operating procedures and start-up, testing, inspection, and operating test plans.
k. Implementing start-up, shakedown, testing, and shutdown activities.
l. Performing facility inspections before, during, and after scheduled R&D operations.
m. Acquiring, reducing, analyzing, reporting, archiving, and reviewing results from experimental units.
n. Preparing, reviewing, and/or assessing criteria for process or component performance evaluations and process stream characterization data for inter-process comparison.

o. Assessing capabilities of existing R&D facilities, organizations, and people for use in resolving technical issues and defining technical requirements for modifications to existing facilities or the establishment of new facilities.
p. Conducting or acquiring analytical measurements of physical and chemical properties of materials utilized in and generated by the R&D operations. This activity includes managing the labeling, shipping, data compilation, and data reporting of the samples analyzed by offsite laboratories, as well as maintaining and upgrading hardware and software required for on-site measurement and data analysis. **For a hot link to the list of Contractor-operated analytical equipment see Section 3.0, Applicable Documents of this SOW.**
q. Assisting in preparing and reviewing documents and packages dealing with ES&H requirements for R&D projects, such as Safety Analysis and Review System (SARS) requirements, environmental management system (EMS) requirements, and conduct of operations requirements.
r. Providing QA/QC oversight for all activities associated with this contract, including the development and maintenance of a quality program that is consistent with the requirements of NETL and DOE orders.
s. Reporting results of research projects through preparation of journal articles and other published papers, as well as presentations at technical conferences and other meetings, in collaboration with Federal scientists and engineers.
t. Supporting R&D operations at off-site Federal facilities, Federally-funded facilities, or those sites having a cooperative relationship with NETL (e.g., supporting the installation, testing and performance validation of technology prototypes in the field).

4.5 Technical Service Area - Process Engineering Design and Analysis

The Contractor shall provide a broad spectrum of expert process engineering, cost estimating, and engineering analysis services that include, but are not necessarily limited to:

a. Performing process engineering, such as: developing and evaluating conceptual process designs, process equipment designs; designs for process optimization, functional specifications, performance estimates, and economic evaluations for energy, environmental, and other processes, facilities, and process equipment; and, preparing system design reports, conceptual design studies, and/or reference plant design studies in sufficient detail and quality for publication.
b. Preparing cost estimates and analyses of capital and operating costs for technologies and processes, including fuel conversion, environmental restoration, and waste management technologies;. performing cost analyses, cost-benefit analyses, economic analyses, and impact studies and developing economic evaluation techniques for the assessment of key process systems, alternative process designs, alternative program/project implementation strategies, energy and/or environmental RD&D projects, schedules, construction plans, and other factors; analyzing costs for factors such as site locations, viability of participant financing, environmental factors, and transportation costs that may impact the process.
c. Supporting the application of cost estimation software, such as Icarus®, to develop cost estimates and cost analysis; developing and documenting specialized cost models for equipment not contained in existing cost model libraries; developing integrated applications of Icarus® with other software systems such as ASPEN Plus®.
d. Participating and assisting in the development of independent Government cost estimates and activity-based cost estimates.
e. Participating in independent assessments, validations, assessments of project cost estimates and schedules, uncertainty and project technical risk analyses, and cost risk analyses and reporting on the results.

4.6 Technical Service Area - Computational Research, Simulation, and Visualization

The Contractor shall provide a broad spectrum of technical and engineering expertise to support computational research, simulation, and visualization efforts, primarily for in-house research. This work will include the development, application, modification, verification, testing, documentation, reporting, and maintenance of computational methods that can be used to examine systems at various scales and complexities. Applications of computational sciences at NETL include computational chemistry, dynamic simulation, predictive-rating modeling, process optimization, parametric studies, watershed analysis, and the design of process units or plants, as well as regional and national energy systems, with the projection of technical, economic, and environmental performance.

Support efforts shall include, but not necessarily be limited to:

a. Developing, evaluating, validating, applying, interpreting, and preparing reports on environmental representation, process, evaluation, impact, and decision models for all media (e.g., air, water, and soils).
b. Analyzing and integrating geological, geochemical, and geophysical data from commercial and Government databases; generating three-dimensional geological models for use in resource assessment and recovery analysis; developing geologic screening models; developing, testing, and validating natural gas systems models; analyzing hydrocarbon reservoirs and basins; and providing drilling and stimulation methods studies and site selection studies for fuel projects, including gas hydrates.
c. Developing, evaluating, validating, documenting, and testing system simulations and engineering process models using ASPEN®, or any of its versions, to ensure compatibility with available simulation codes and commercially available simulators. Providing support to NETL tasks with ASPEN®, or other simulators, and incorporating improved capabilities into ASPEN®. Evaluating other hardware or software products, such as a desktop process simulator to complement ASPEN® that could enhance NETL capabilities. Translating selected simulations from other ASPEN®
d. Developing, evaluating, validating, documenting and testing simulations and models using energy system models such as NEMS, GEMSET, and macro-economic models such as DRI's, or similar modeling systems, to analyze energy systems and markets. Providing support to NETL tasks with NEMS, GEMSET, or others, to incorporate improved capabilities into these models.
e. Providing technical assistance and service for specialized hardware and software systems, such as ASPEN®, Icarus®, ICEM® or ICEM-CS®, DIPPR®, GATE®, WAVE®, GT/PRO®, and PC-Trax®, the archival system, and other software development. Supporting maintenance of specialized computer hardware, software, archival, and documentation systems required to perform functions under this task area.
f. Developing, evaluating, validating, applying, interpreting, and preparing reports on global climate change models that simulate the engineering, economic, and environmental impacts of climate mitigation strategies, including various sequestration options. These models could include, but are not limited to, MARKAL®, IPM®, and others.
g. Providing technical expertise and support in the area of computational chemistry modeling comprising activities related to the development and application of methods for obtaining fundamental information on molecular processes at small time and distance scales (10^{-15}s to 10^{-6}s and 10^{-10}m to 10^{-6}m). These include *ab initio* and first principles calculations (e.g., density functional theory), molecular dynamics and Monte Carlo simulations, transition state modeling, and kinetics modeling. Some of the problems of interest for calculations include: catalytic processes on surfaces; equilibrium and non-equilibrium systems; structural, electronic, and spectroscopic properties of adsorbates, surfaces and bulk materials; transport properties (diffusion); and kinetics and thermodynamics studies.
h. Providing application, custom model development, and model validation for simulations describing advanced power generation components and systems using FLUENT® and MFIX computational fluid dynamics software; ANSYS finite element analysis software; CHEMKIN® chemical kinetics software; and process modeling software including ASPEN Plus®, ASPEN Custom Modeler®, ASPEN Dynamics®, and the ASPEN®-FLUENT® and REI advanced power systems software.
i. Providing technical expertise, assistance, and support for application and custom development of visualization, virtual reality, and post processing software, including 3D Studio Max®; VRtools®; ENSIGHT®; FLUENT®, MFIX; and AVS®.
j. Providing hardware and software support for setup and operation of the following computer and visualization systems: scientific local area networks, including maintenance of network security; Linux®-based PC clusters; individual research workstations; RAID data storage systems; visualization laboratory facilities; and a high-speed gigapop connection to the Pittsburgh Supercomputer Center. Also to be provided is software installation and administration for all research software packages and developing requirements and specifications for purchases of research computer systems and software.
k. Providing hardware and software support for NETL R&D activities associated with the supercomputer system located at the Pittsburgh Supercomputer Center and under the Supercomputing Science Consortium ($(SC)^2$) agreement, including using supercomputer time for NETL researchers and Contractors; code modifications for parallel computers; scheduling software archiving and retrieval of large data files in its existing facility; assistance and advice on connecting to and using high speed networks such as Esnet; and

operating, testing, coordinating, and scheduling the use of a supercluster of computers to be established under the $(SC)^2$ agreement.

l. Reporting results of research projects through preparation of journal articles and other published papers, as well as presentations at technical conferences and other meetings, in collaboration with Federal scientists and engineers.

4.7 Technical Service Area - Environmental, Safety, and Health Assurance

The Contractor shall provide ES&H assurance and Integrated Safety Management (ISM) support to all of NETL, including supporting on-site research and site operations. The task is primarily in support of and aligned with the current functions of NETL's Environmental, Safety, and Health Division and the execution of its mission. This mission includes conducting risk assessment, risk reduction, and risk management activities for NETL. Much of the work is geared toward providing assistance through consulting services and implementing requirements within existing DOE/NETL managed ES&H programs, processes, and directives, as well as the regulations, laws, and consensus standards upon which these are based.

These activities include, but are not limited to, the following items summarized below. **For the hot link to the sample ES&H task, see Section 3.0, Applicable Documents of this SOW.**

a. Implementing and maintaining programs that support NETL's ***environmental compliance, monitoring, and surveillance requirements***. These programs include the Air Quality Program, the Water Quality Program, the Radiological Surveillance Program, and the Waste Minimization and Pollution Prevention Program. A registered professional engineer in either the environmental engineering or the civil/sanitary engineering field shall be part of the on-site support staff. The Contractor shall:

- Assist in implementing the permitting, compliance, monitoring, surveillance, reporting, and emergency response requirements of NETL's environmental programs.
- Provide recurring environmental consulting services to NETL personnel as requested.
- Support the process of reviewing and revising NETL's environmental directives (e.g., orders, operating plans, and procedures) and associated implementing plans.
- Assist and support NETL's efforts to maintain Environmental Management System (e.g., ISO-14001) certification.
- Provide ISM support.

b. Implementing and maintaining programs that support NETL's ***hazardous waste management program.*** These activities include, but are not limited to, the following:

- Assisting in implementing the permitting, compliance, monitoring, surveillance, reporting, and emergency response requirements of NETL's hazardous waste program.
- Operating and maintaining NETL's Chemical and Waste Handling Facilities (i.e., the Chemical Handling Facility at the Pittsburgh, PA site and Building-33 at the Morgantown, WV site).
- Maintaining waste materials inventories (including accumulation date and material characterization and identification information).
- Performing inspections of materials received.
- Ensuring that employees and subcontractors have received the necessary training to work safely in these facilities and to abide by applicable environmental regulations and transportation regulations.
- Preparing hazardous waste manifests and land disposal restriction documents.
- Archiving documentation according to DOE record management schedules.
- Obtaining chemical analyses where needed or requested to determine chemical identity for classification as a hazardous or regulated substance.
- Performing hazardous wastes packaging and labeling prior to shipping for disposal, as well as arranging (through subcontracts) shipments of hazardous and regulated substances to appropriate treatment, storage, and disposal facilities.

c. Providing ***industrial hygiene and occupational medical support services*** for NETL facilities and assisting

in implementing the permitting, compliance, monitoring, surveillance, reporting, and emergency response requirements of NETL's industrial hygiene and occupational medicine programs. A certified industrial hygienist shall be part of the on-site support staff at the Pittsburgh and Morgantown locations. This activity includes the operation of occupational health units staffed with licensed occupational nurses and physicians and providing support to the industrial hygiene and occupational medicine program, including conducting efforts related to:

- Ergonomics.
- Personnel exposure and workplace monitoring.
- Ventilation.
- Personal protective equipment (PPE) use.
- Medical, occupational health, and wellness programs.
- Radiation monitoring.
- Chemical inventory programs.
- Hazards communication (HAZCOM) programs.
- Safety and health directives development and updates.
- Internal audits.
- Asbestos sampling, monitoring, and oversight.

d. Providing ***safety support services and ES&H compliance training*** and assisting in implementing the permitting, compliance, monitoring, surveillance, reporting, and emergency response requirements of NETL's safety and ES&H training programs. A certified safety professional shall be part the onsite support staff. These efforts will support:

- Compliance-oriented safety programs.
- Safety evaluations.
- Emergency preparedness and response program.
- Fire protection program.
- R&D Safety Analysis and Review System (SARS).
- Support Operations SARS.
- Facility SARS
- Site inspections.
- Accident investigations.
- Occurrence reporting.
- Safety directives development and updates.
- Performance measurement program.
- ES&H training, including the design, development, and deployment of computer-based training modules.
- Tracking of ES&H training.

e. Providing ES&H support to NETL's ***site operations*** activities. This support shall include providing oversight and technical assistance on ES&H matters with respect to site operations activities that involve or impact safety, industrial hygiene, and environmental requirements. For example, the Contractor shall provide technical assistance on ES&H issues associated with:

- NETL-Pittsburgh Wastewater Treatment Facility (e.g., issues dealing with permitting, plant operations, process automation, and chemistry).
- NETL refrigerant (e.g. ozone-depleting substances) management program.
- General construction activities.
- Grounds-keeping, janitorial, and site maintenance activities.
- Management of fire protection systems and gas alarms.

f. Providing personnel and expertise to support ***off-site remediation*** at NETL-owned sites, leased sites, or sites where NETL is the authority having jurisdiction. Current off-site remediation work is being

performed at the Hoe Creek Underground Coal Gasification Test Site located near Gillette, WY; the Rock Springs Oil Shale Retort Site located near Rock Springs, WY; and the Rocky Mountain 1 Site and the DOE Hanna Underground Coal Gasification Site near Hanna, WY. During the course of this contract, other sites may be identified requiring remediation support. Remediation support shall include, but not be limited to:

- Performing intermittent minor maintenance, including re-vegetation, at field sites identified by NETL.
- Conducting field operations related to groundwater remediation at Rock Springs, WY (as well as other sites).
- Ensuring remediation site(s) compliance with Federal, state and local requirements.
- Providing support and assistance with regard to analyses, reports, and presentations.
- Preparing reports and presentations relative to current and planned operations and activities.
- Investigating the location of abandoned wells which were drilled as part of previous DOE R&D activities.
- Investigating other inactive waste sites (e.g., performing Phase I/Phase II investigations, remedial investigation/feasibility studies, and remediations).

g. Assisting in the development, management, and tracking of all NETL directives (e.g., orders, operating plans, and procedures) and supporting the quality management systems and processes associated with document (including directives) control.

The Contractor shall adhere to all pertinent NETL ES&H Focused Standards as indicated in the Focused Standards list which is currently posted on the SSC electronic reading room under Section 5.0, Directives and Policies located at www.netl.doe.gov/business/solict/ssc2003/index.html. After contract award, the list will be available at the following NETL Intranet site: http://intranet/project/ESHINFO/standard/focused.pdf. This Focused Standards List has been primarily derived from selected Standard References contained in NETL issued directives. This list is the totality of ES&H standards and requirements that (through analysis of specific operations) apply to NETL's operations. It should not be construed that all of the standards on the list would be applicable to operations required under this contract.

4.8 Service Area - Management Performance

The Contractor shall develop and implement innovative approaches and adopt practices that foster continual improvement in accomplishing the mission of NETL and in providing quality, cost effective support services to NETL.

The Contractor shall use effective and efficient management structures, systems, and operations that are cost-effective while achieving and maintaining high levels of quality and a proactive ES&H culture in accomplishing NETL's mission. This proactive ES&H culture shall include: (1) the ability to apply DOE's Integrated Safety Management's (ISM) seven principles and five functions in planning, budgeting, executing, and improving its management and work activities; (2) the successful execution of requirements in the Contractor's ISM plan; and (3) the continual improvement of NETL's environmental posture by using EMS to manage environmental risk.

The Contractor shall plan and execute work in such a manner that it will objectively demonstrate competence in areas such as problem resolution, coordination, innovation, and manpower management. In addition, the Contractor shall conduct all work in a manner that continually improves productivity, minimizes waste, and complies with all applicable laws, regulations, and terms and conditions of the contract, including attaining socioeconomic goals.

5.0 PERFORMANCE REQUIREMENTS SUMMARY

Performance requirements of this contract are expressed in the following manner:

Each performance requirement will contain the following three elements. In each case, when taken together, these elements constitute a performance requirement.

Performance Objective - A statement of the outcome or results expected for the work accomplished under the various task orders which will be issued under the contract. Performance objectives for the Technical Service Areas depicted in Sections 4.1 through 4.7 will be set forth in the individual task orders issued.

Performance Measures - The critical few characteristics or aspects of achieving the objective that will be monitored by the Government, i.e., those things about which the Government will be gathering data for the purpose of evaluating the performance of the Contractor. Performance objectives identified in each task order may have one or more measures. The list of suggested performance measures is provided below. A more detailed definition of what is covered in a particular performance measure and what the key factors are in the measure that will be considered for evaluation purposes is identified in the Performance Requirements Summary Table below under Description of Performance Measures.

Performance Expectations - The targeted level or range of levels of performance for each performance measure. Performance expectations for the performance measures listed below are located in Part III, Section J, Attachment C, Performance Evaluation Plan.

The following Performance Requirements Summary identifies the list of performance measures, one or more of which will be applied to performance objectives in task orders issued under this contract covering work accomplished under the Technical Service Areas in Sections 4.1 through 4.7 and the Management Performance service area in Section 4.8.

PERFORMANCE REQUIREMENTS SUMMARY TABLE

Performance Measures	Description of Performance Measures	Performance Expectations
Quality of Work Products	DOE will assess the degree to which work products are accurate (i.e., free of typographical, grammatical, mathematical, and conceptual errors), complete and relevant with regard to DOE requests, professional in appearance and format, and accepted by DOE without revision.	Work products are (1) always accurate, complete, relevant, and professional, and are (2) always accepted without revision.
Quality of Work Processes	DOE will evaluate the degree to which the Contractor executes work processes in adherence to, and compliance with, established procedures without intervention from the Government.	Work processes (1) are always executed according to prescribed procedures, and (2) require no intervention from the Government.
Productivity	DOE will assess the completion of tasks and the quantity of work performed with respect to that planned, expected, or assigned.	Tasks are always completed as assigned, and the quantity of work performed frequently exceeds that planned, expected, or assigned.
Schedule Control	DOE will assess the timeliness of deliverables, completion of milestones, and responsiveness to DOE requests, or range of schedule variance.	Milestones, deliverables and DOE requests are always completed on time, or schedule variance is always zero and always a positive number.
Cost Control	DOE will assess adherence to budgets and accuracy of cost estimates, or range of cost variance.	Work is always under budget, costs are always accurately estimated, and cost control measures have been effectively demonstrated.
ES&H Compliance	DOE will assess the achievement of all of the ES&H requirements as outlined in ISM	Applicable ES&H requirements as outlined in ISM plans, NETL directives,

PERFORMANCE REQUIREMENTS SUMMARY TABLE		
Performance Measures	Description of Performance Measures	Performance Expectations
	plans, NETL directives, NETL ES&H metrics, and Federal, state, and local regulations, and initiatives for continuous improvement.	NETL ES&H metrics, and Federal, state, and local regulations are always achieved, and continuous improvement initiatives are usually achieved.
Value Added	DOE will assess the Contractor for its ability to recommend and implement, if approved, innovative and creative approaches to performing work that result in significant benefits in quality, cost, timeliness, and productivity, and, when appropriate, significantly advances or augments NETL's scientific and technological capabilities.	The Contractor frequently recommends and implements innovative and creative approaches that have actual or potential significant benefits, and that significantly advance or augment NETL's scientific and technological capabilities.

6.0 GLOSSARY

6.1 Acronyms

Acronym	Definition
CIH	Certified Industrial Hygienist
CSP	Certified Safety Specialist
CRADA	Cooperative Research and Development Agreement
DOE	Department of Energy
DRI	Data Resource Institute
EMS	Environmental Management System
ES&H	Environmental, Safety and Health
GOGO	Government-Owned and Government-Operated
GPRA	Government Performance and Results Act
HAZCOM	Hazards Communication
ISA	Instrument Society of America
ISM	Integrated Safety Management
LAN	Local Area Network
MGN	Morgantown
M&O	Management and Operation (refers to a type of DOE contract)
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
OHU	Occupational Health Units
OMB	Office of Management and Budget
OSHA	Occupational, Safety and Health Administration
PGH	Pittsburgh
P&IDs	Process and Instrumentation Drawing
PPE	Personal Protective Equipment
R&D	Research and Development
RD&D	Research, Development and Demonstration (a type of project)
REI	Reaction Engineering International
SARS	Safety Analysis and Review System
$(SC)^2$	Supercomputing Science Consortium

6.2 Words/Phrases

Core work – predictable, schedulable, and recurring work of a longer duration (typically 1 year or more)

Large-scale – construction or modification of an onsite R&D facility that involves significant addition, deletion, or change to a site's or building's structure, infrastructure, or utilities. Such an effort would be limited in this contract to the design phase, with the construction phase being completed by the site operations support Contractor. NETL will make the determination of what facilities constitute large-scale versus small-scale.

Offsite – any location not on one of the NETL sites as defined in "onsite" below.

Onsite – Federally-owned or leased property within the defined boundaries of the sites at Pittsburgh, PA; Morgantown, WV; Tulsa, OK; and Fairbanks, AL, including, in the case of Morgantown, the Research Ridge complex immediately adjacent to the boundary.

Small-scale – construction or modification of an onsite R&D facility that does not involve significant addition, deletion, or change to a site's or building's structure, infrastructure, or utilities. Such an effort would be conducted primarily within this contract. NETL will make the determination of what facilities constitute large-scale versus small-scale.

Variable work – work that is shorter term (typically less than 1 year) and variable in nature with respect to the amount of work, the timing of work, the duration of work, and the scope of work.